## **CLAIMS**

## What is claimed is:

- 1. An isolated polynucleotide, wherein the polypeptide comprises a sequence of amino acid residues that is selected from the group consisting of:
- (a) the amino acid sequence as shown in SEQ ID NO:2 from amino acid number 20 (Ala) to amino acid number 227 (Pro);
- (b) the amino acid sequence as shown in SEQ ID NO:2 from amino acid number 20 (Ala) to amino acid number 519 (Glu);
- (c) the amino acid sequence as shown in SEQ ID NO:2 from amino acid number 20 (Ala) to amino acid number 543 (Leu);
- (d) the amino acid sequence as shown in SEQ ID NO:2 from amino acid number 544 (Lys) to amino acid number 732 (Val);
- (e) the amino acid sequence as shown in SEQ ID NO:46 from amino acid number 544 (Lys) to amino acid number 649 (Ile);
- (f) the amino acid sequence as shown in SEQ ID NO:2 from amino acid number 20 (Ala) to amino acid number 732 (Val);
- (g) the amino acid sequence as shown in SEQ ID NO:46 from amino acid number 20 (Ala) to amino acid number 649 (Ile);
- (h) the amino acid sequence as shown in SEQ ID NO:2 from amino acid number 1 (Met) to amino acid number 732 (Val); and
- (i) the amino acid sequence as shown in SEQ ID NO:46 from amino acid number 1 (Met) to amino acid number 649 (Ile).
- 2. An isolated polynucleotide comprising a sequence selected from the group consisting of:
- (a) a polynucleotide as shown in SEQ ID NO:1 from nucleotide number 228 to amino acid number 851;
- (b) a polynucleotide as shown in SEQ ID NO:1 from nucleotide number 228 to amino acid number 1727;

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- (c) a polynucleotide as shown in SEQ ID NO:1 from nucleotide number 228 to amino acid number 1799;
- (d) a polynucleotide as shown in SEQ ID NO:1 from nucleotide number 1800 to amino acid number 2366;
- (e) a polynucleotide as shown in SEQ ID NO:45 from nucleotide number 1791 to amino acid number 2108;
- (f) a polynucleotide as shown in SEQ ID NO:1 from nucleotide number 228 to amino acid number 2366;
- (g) a polynucleotide as shown in SEQ ID NO:45 from nucleotide number 219 to amino acid number 2108;
- (h) a polynucleotide as shown in SEQ ID NO:1 from nucleotide number 171 to amino acid number 2366;
- (i) a polynucleotide as shown in SEQ ID NO:45 from nucleotide number 162 to amino acid number 2108; and
  - (j) a polynucleotide sequence complementary to (a) through (i).
- 3. An isolated polynucleotide according to claim 1, wherein the polypeptide further comprises a transmembrane domain consisting of residues 520 (Ile) to 543 (Leu) of SEQ ID NO:2.
- 4. An isolated polynucleotide according to claim 1, wherein the polypeptide further comprises an intracellular domain consisting of residues 544 (Lys) to 732 (Val) of SEQ ID NO:2 or 544 (Lys) to 649 (Ile) of SEQ ID NO:46.
- 5. An isolated polynucleotide according to claim 1, wherein the polypeptide encoded by the polynucleotide has activity as measured by cell proliferation, activation of transcription of a reporter gene, or wherein the polypeptide encoded by the polynucleotide further binds to an antibody,

wherein the antibody is raised to a polypeptide comprising a sequence of amino acids from the group consisting of:

- (a) the polypeptide comprising amino acid number 20 (Ala) to 227 (Pro) of SEQ ID NO:2;
- (b) the polypeptide comprising amino acid number 20 (Ala) to 519 (Glu) of SEQ ID NO:2;
- (c) the polypeptide comprising amino acid number 20 (Ala) to 543 (Leu) of SEQ ID NO:2;
- (d) the polypeptide comprising amino acid number 544 (Lys) to 732 (Val) of SEQ ID NO:2;
- (e) the polypeptide comprising amino acid number 544 (Lys) to 649 (Ile) of SEQ ID NO:46;
- (f) the polypeptide comprising amino acid number 20 (Ala) to 732 (Val) of SEQ ID NO:2;
- (g) the polypeptide comprising amino acid number 20 (Ala) to 649 (Ile) of SEQ ID NO:46;
- (h) the polypeptide comprising amino acid number 1 (Met) to 732 (Val) of SEQ ID NO:2; and
- (i) the polypeptide comprising amino acid number 1 (Met) to 649 (Ile) of SEQ ID NO:46, and

wherein the binding of the antibody to the isolated polypeptide is measured by a biological or biochemical assay including radioimmunoassay, radioimmuno-precipitation, Western blot, or enzyme-linked immunosorbent assay.

6. An expression vector comprising the following operably linked elements:

a transcription promoter;

a DNA segment encoding a polypeptide comprising an amino acid sequence as shown in SEQ ID NO:2 from amino acid number 20 (Ala) to 732 (Val) or an amino acid sequence as shown in SEQ ID NO:46 from amino acid number 20 (Ala) to 649 (Ile); and

a transcription terminator,

wherein the promoter is operably linked to the DNA segment, and the DNA segment is operably linked to the transcription terminator.

- 7. An expression vector according to claim 6, further comprising a secretory signal sequence operably linked to the DNA segment.
- 8. A cultured cell comprising an expression vector according to claim 7, wherein the cell expresses a polypeptide encoded by the DNA segment.
- 9. An expression vector according to claim 6, wherein the DNA segment encodes a polypeptide comprising an amino acid sequence as shown in SEQ ID NO:2 from amino acid number 20 (Ala) to 227 (Pro); or as shown in SEQ ID NO:2 from amino acid number 20 (Ala) to 519 (Glu); and

a transcription terminator, wherein the promoter, DNA segment, and terminator are operably linked.

- 10. An expression vector according to claim 9, further comprising a secretory signal sequence operably linked to the DNA segment.
- 11. An expression vector according to claim 9, wherein the polypeptide further comprises a transmembrane domain consisting of residues 520 (IIe) to 543 (Leu) of SEQ ID NO:2.
- 12. An expression vector according to claim 9 wherein the polypeptide further comprises an intracellular domain consisting of residues 544 (Lys) to 732 (Val) of SEQ ID NO:2, or residues 544 (Lys) to 649 (Ile) of SEQ ID NO:46.
- 13. A cultured cell into which has been introduced an expression vector according to claim 9, wherein the cell expresses a soluble receptor polypeptide encoded by the DNA segment.
- 14. A DNA construct encoding a fusion protein, the DNA construct comprising:

- a first DNA segment encoding a polypeptide comprising a sequence of amino acid residues selected from the group consisting of:
- (a) the amino acid sequence of SEQ ID NO:2 from amino acid number 1 (Met), to amino acid number 19 (Ala);
- (b) the amino acid sequence of SEQ ID NO:54 from amino acid number 1 (Met), to amino acid number 32 (Ala);
- (c) the amino acid sequence of SEQ ID NO:2 from amino acid number 20 (Ala), to amino acid number 227 (Pro);
- (d) the amino acid sequence of SEQ ID NO:2 from amino acid number 20 (Ala), to amino acid number 519 (Glu);
- (e) the amino acid sequence as shown in SEQ ID NO:2 from amino acid number 20 (Ala) to amino acid number 543 (Leu);
- (f) the amino acid sequence as shown in SEQ ID NO:2 from amino acid number 520 (Ile) to amino acid number 543 (Leu);
- (g) the amino acid sequence as shown in SEQ ID NO:2 from amino acid number 544 (Lys) to amino acid number 732 (Val);
- (h) the amino acid sequence as shown in SEQ ID NO:46 from amino acid number 544 (Lys) to amino acid number 649 (IIe);
- (i) the amino acid sequence as shown in SEQ ID NO:2 from amino acid number 20 (Ala) to amino acid number 732 (Val); and
- (j) the amino acid sequence as shown in SEQ ID NO:46 from amino acid number 20 (Ala) to amino acid number 649 (Ile); and
  - at least one other DNA segment encoding an additional polypeptide, wherein the first and other DNA segments are connected in-frame; and wherein the first and other DNA segments encode the fusion protein.
- 15. An expression vector comprising the following operably linked elements:
  - a transcription promoter;
  - a DNA construct encoding a fusion protein according to claim 14; and a transcription terminator,

wherein the promoter is operably linked to the DNA construct, and the DNA construct is operably linked to the transcription terminator.

- 16. A cultured cell comprising an expression vector according to claim 15, wherein the cell expresses a polypeptide encoded by the DNA construct.
  - 17. A method of producing a fusion protein comprising: culturing a cell according to claim 16; and isolating the polypeptide produced by the cell.
- 18. An isolated polypeptide comprising a sequence of amino acid residues selected from the group consisting of:
- (a) the amino acid sequence as shown in SEQ ID NO:2 from amino acid number 20 (Ala) to amino acid number 227 (Pro);
- (b) the amino acid sequence as shown in SEQ ID NO:2 from amino acid number 20 (Ala) to amino acid number 519 (Glu);
- (c) the amino acid sequence as shown in SEQ ID NO:2 from amino acid number 20 (Ala) to amino acid number 543 (Leu);
- (d) the amino acid sequence as shown in SEQ ID NO:2 from amino acid number 544 (Lys) to amino acid number 732 (Val);
- (e) the amino acid sequence as shown in SEQ ID NO:46 from amino acid number 544 (Lys) to amino acid number 649 (Ile);
- (f) the amino acid sequence as shown in SEQ ID NO:2 from amino acid number 20 (Ala) to amino acid number 732 (Val);
- (g) the amino acid sequence as shown in SEQ ID NO:46 from amino acid number 20 (Ala) to amino acid number 649 (Ile);
- (h) the amino acid sequence as shown in SEQ ID NO:2 from amino acid number 1 (Met) to amino acid number 732 (Val); and
- (i) the amino acid sequence as shown in SEQ ID NO:46 from amino acid number 1 (Met) to amino acid number 649 (Ile).

- 19. An isolated polypeptide according to claim 18, wherein the polypeptide further comprises a transmembrane domain consisting of residues 520 (IIe) to 543 (Leu) of SEQ ID NO:2.
- 20. An isolated polypeptide according to claim 18 wherein the polypeptide further comprises an intracellular domain consisting of residues 544 (Lys) to 732 (Val) of SEQ ID NO:2 or 544 (Lys) to 649 (Ile) of SEQ ID NO:46.
- 21. An isolated polynucleotide according to claim 18 wherein the polypeptide has activity as measured by cell proliferation, activation of transcription of a reporter gene, or wherein the polypeptide encoded by the polynucleotide further binds to an antibody,

wherein the antibody is raised to a polypeptide comprising a sequence of amino acids from the group consisting of:

- (a) the polypeptide comprising amino acid number 20 (Ala) to 227 (Pro) of SEQ ID NO:2;
- (b) the polypeptide comprising amino acid number 20 (Ala) to 519 (Glu) of SEQ ID NO:2;
- (c) the polypeptide comprising amino acid number 20 (Ala) to 543 (Leu) of SEO ID NO:2;
- (d) the polypeptide comprising amino acid number 544 (Lys) to 732 (Val) of SEQ ID NO:2;
- (e) the polypeptide comprising amino acid number 544 (Lys) to 649 (Ile) of SEQ ID NO:46;
- (f) the polypeptide comprising amino acid number 20 (Ala) to 732 (Val) of SEQ ID NO:2;
- (g) the polypeptide comprising amino acid number 20 (Ala) to 649 (Ile) of SEQ ID NO:46;
- (h) the polypeptide comprising amino acid number 1 (Met) to 732 (Val) of SEQ ID NO:2; and

of:

(i) the polypeptide comprising amino acid number 1 (Met) to 649 (Ile) of SEQ ID NO:46, and

wherein the binding of the antibody to the isolated polypeptide is measured by a biological or biochemical assay including radioimmunoassay, radioimmuno-precipitation, Western blot, or enzyme-linked immunosorbent assay.

- 22. A method of producing a polypeptide comprising: culturing a cell according to claim 8; and isolating the polypeptide produced by the cell.
- 23. An isolated polypeptide comprising an amino acid segment selected from the group consisting of:
- (a) the amino acid sequence as shown in SEQ ID NO:2 from amino acid number 20 (Ala) to amino acid number 227 (Pro);
- (b) the amino acid sequence as shown in SEQ ID NO:2 from amino acid number 20 (Ala) to amino acid number 519 (Glu);
  - (c) the amino acid sequence as shown in SEQ ID NO:18; and
  - (d) the amino acid sequence as shown in SEQ ID NO:22,

wherein the polypeptide is substantially free of transmembrane and intracellular domains ordinarily associated with hematopoietic receptors.

- 24. A method of producing a polypeptide comprising: culturing a cell according to claim 13; and isolating the polypeptide produced by the cell.
- 25. A method of producing an antibody to a polypeptide comprising: inoculating an animal with a polypeptide selected from the group consisting

- (a) a polypeptide consisting of 9 to 713 amino acids, wherein the polypeptide comprises a contiguous sequence of amino acids in SEQ ID NO:2 from amino acid number 20 (Ala), to amino acid number 732 (Val);
- (b) a polypeptide consisting of 9 to 630 amino acids, wherein the polypeptide comprises a contiguous sequence of amino acids in SEQ ID NO:46 from amino acid number 20 (Ala), to amino acid number 649 (Ile);
- (c) a polypeptide comprising amino acid number 20 (Ala) to 227 (Pro) of SEQ ID NO:2;
- (d) a polypeptide comprising amino acid number 20 (Ala) to 519 (Glu) of SEQ ID NO:2;
- (e) a polypeptide comprising amino acid number 20 (Ala) to 543 (Leu) of SEQ ID NO:2;
- (f) a polypeptide comprising amino acid number 544 (Lys) to 732 (Val) of SEQ ID NO:2;
- (g) a polypeptide comprising amino acid number 544 (Lys) to 649 (Ile) of SEQ ID NO:46;
- (h) a polypeptide comprising amino acid number 20 (Ala) to 732 (Val) of SEQ ID NO:2;
- (i) a polypeptide comprising amino acid number 20 (Ala) to 649 (Ile) of SEQ ID NO:46;
- (j) a polypeptide comprising amino acid number 1 (Met) to 732 (Val) of SEQ ID NO:2;
- (k) a polypeptide comprising amino acid number 1 (Met) to 649 (Ile) of SEQ ID NO:46,
- (l) a polypeptide comprising amino acid residues 43 through 48 of SEQ ID NO:2;
- (m) a polypeptide comprising amino acid residues 157 through 162 of SEQ ID NO:2;
- (n) a polypeptide comprising amino acid residues 158 through 163 of SEQ ID NO:2;

- (o) a polypeptide comprising amino acid residues 221 through 226 of SEQ ID NO:2; and
- (p) a polypeptide comprising amino acid residues 426 through 431 of SEQ ID NO:2; and

wherein the polypeptide elicits an immune response in the animal to produce the antibody; and

isolating the antibody from the animal.

- 26. An antibody produced by the method of claim 25, which specifically binds to a polypeptide of SEQ ID NO:2 or SEQ ID NO:46.
- 27. The antibody of claim 26, wherein the antibody is a monoclonal antibody.
  - 28. An antibody that specifically binds to a polypeptide of claim 18.
- 29. A method of detecting, in a test sample, the presence of a modulator of cytokine receptor protein activity, comprising:

culturing a cell into which has been introduced an expression vector according to claim 9, wherein the cell expresses the protein encoded by the DNA segment in the presence and absence of a test sample; and

comparing levels of activity of the protein in the presence and absence of a test sample, by a biological or biochemical assay; and

determining from the comparison, the presence of modulator of the protein activity in the test sample.

30. A method for detecting a cytokine receptor ligand within a test sample, comprising:

contacting a test sample with a polypeptide comprising an amino acid sequence from the group consisting of:

- (a) the amino acid sequence as shown in SEQ ID NO:2 from amino acid number 20 (Ala) to amino acid number 227 (Pro);
- (b) the amino acid sequence as shown in SEQ ID NO:2 from amino acid number 20 (Ala) to amino acid number 519 (Glu);
  - (e) the amino acid sequence as shown in SEQ ID NO:18; the amino acid sequence as shown in SEQ ID NO:22; and detecting the binding of the polypeptide to a ligand in the sample.
- 31. A method according to claim 30 wherein the polypeptide is membrane bound within a cultured cell, and the detecting step comprises measuring a biological response in the cultured cell.
- 32. A method according to claim 31 wherein the biological response is cell proliferation or activation of transcription of a reporter gene.